



COURSE SYLLABUS SEMANTIC WEB AND ONTOLOGIES

1. Program identification details

1.1 Higher education institution	"OVIDIUS" UNIVERSITY OF CONSTANȚA
1.2 Faculty	Mathematics and Informatics
1.3 Department	Mathematics and Informatics
1.4 Field of study	Computer Science
1.5 Degree	Master
1.6 Programme of study	Cyber Security and Machine Learning
1.7 Academic year	2025-2026

2. Course identification details

2.1 Course title	Semantic Web and Ontologies						
2.2 Course code	FMI.CSML.II.1.02						
2.3 Lecture instructor	Assoc. Prof. Puchianu Crenguta Madalina, PhD						
2.4 Seminar instructor	Assoc. Prof. Puchianu Crenguta Madalina, PhD						
2.5 Year	2	2.6 Semester	1	2.7 Evaluation	E	2.8 Course type	DCA/DI

3. Estimated workload (hours per semester)

3.1 Number of teaching hours/week	4	of which: 3.2 lecture	2	3.3 applications***	2
3.4 Number of teaching hours/semester	56	of which: 3.5 lecture	28	3.6 applications	28
3.7 Individual study workload					144
Workload distribution					[hours]
Reading (books, coursebooks, course reader, lecture notes, course bibliography)					40
Additional library / specialised platform research and fieldwork					30
Seminar / lab / project preparation, home assignments, research papers, portfolios and essays					30
Presentation or test preparation					10
Final examination preparation					24
Other activities: tutorials					10
3.8 Total hours/semester	200				
3.9 Number of credits	8				

*** S - seminar; L - lab; P - project

4. Prerequisites (where applicable)

4.1 curriculum-related	-
4.2 skills-related	-



5. Necessary requirements for optimum teaching and learning (where applicable)

5.1. for running the lecture	Classroom available
5.2. for running the lab	Classroom/laboratory room available

6. Course objectives

6.1 The general objective of the course	Familiarizing master's students with describing resources on the Web and building ontologies.
6.2 Specific objectives	Building a taxonomy Building a process ontology using a high-level ontology Using the Protégé editor Using an ontology in the design and implementation of software systems

7. Learning outcomes

Knowledge	The student / graduate: <ul style="list-style-type: none">– knows several languages or standards for describing metadata in web pages– knows a methodology for building an ontology– knows various software tools useful in creating semantically annotated web pages and ontologies
Skills	The student / graduate: <ul style="list-style-type: none">– Create semantically annotated pages using different standards– Create object-oriented programs that read metadata from annotated web pages– Build process ontologies of medium complexity– Use the Protégé editor to describe the concepts of an ontology and the relationships between them– Use the Protégé editor to check the consistency of an ontology
Responsibility and autonomy	The student / graduate: <ul style="list-style-type: none">– has a discerning attitude when using information sources– carry out individually a project of realization of a process ontology– fulfills on time, in a rigorous manner, professional tasks of medium complexity

8. Contents

8.1 Lecture	Teaching methods	No. of hours
World Wide Web. Preliminaries. Web architecture. Identifying Web resources.	Interactive learning teaching methods	1 hour
Date vs. metadata. Specification of metadata with microdata and JSON-LD.		4 hours
Metadata description languages: RDF. The structure of a document written in RDF. Specifying RDF constructions in HTML pages using RDFa.		4 hours
Ontologies. Ontology in the field of informatics. Differences between philosophical ontology and ontology. The purpose of an ontology. Classification of ontologies. Types of ontologies.	Dialogue	1 hour
Languages for writing ontologies. OWL language. Language variants: OWL Lite, OWL DL, OWL Full. Specification of classes, properties, individuals.	Methods that contribute to the development of critical thinking	2 hours
High level ontologies. DOLCE Ontology. High level categories. Formal ontological relations. Ontology D&S.		2 hours
Carrying out a taxonomy using the Protege editor	Programs	2 hours
Defining relationships and restrictions on concepts		2 hours



The SWRL language. SWRL rules	Independent and cooperative learning	4 hours
Ontop system. Validation of an ontology using Ontop		2 hours
Ontop mappings. Querying the ontology with SPARQL		4 hours
Bibliography		
<p>[1]. S. Buraga, S. Buraga, Tehnologii XML, Polirom, Iași, 2006</p> <p>[2]. S. Buraga, Semantic Web, Matrix Rom, București, 2004</p> <p>[3]. A. Gangemi, P. Mika, “Understanding the Semantic Web through Descriptions and Situations”, International Conference ODBASE03, Italy, Springer, 2003</p> <p>[4]. C. Masolo, S. Borgo, A. Gangemi, N. Guarino, A. Oltramari: WonderWeb Deliverable D18. Ontology Library. IST Project 2001-33052 WonderWeb: Ontology Infrastructure for the Semantic Web, 2003</p> <p>[5]. S. J. Russel, P. Norvig, Artificial Intelligence. A Modern Approach, Prentice Hall, 1995</p> <p>[6]. G. Antoniou, F. van Harmelen, A Semantic Web Primer, second edition, MIT Press, 2008</p> <p>[7]. J. Gennari, M. Musen, R. Fergerson, W. Grosso, M. Crubzy, H. Eriksson, N. Noy, S. Tu, The evolution of Protégé-2000: An environment for knowledge-based systems development. International Journal of Human-Computer Studies, 58(1):89-123, 2003.</p> <p>[8]. N.F. Noy, D. McGuinness, A Guide to building ontologies: Ontology Development 101. A Guide to Creating Your First Ontology, March, 2001 at http://www.ksl.stanford.edu/people/dlm/papers/ontology101/ontology101-noy-mcguinness.html</p> <p>[9]. Popovici D. M., Zaharescu E., Rusu A., Puchianu C.M., Sburlan D., Medii virtuale multimodale distribuite, Editura Universitaria Craiova și Editura Prouniversitaria Bucuresti, 978- 606-26-0049-5, 2015, vol 3, 266 pag.</p> <p>[10]. World Wide Web Consortium. OWL Web Ontology Language Reference. W3C Recommendation, 2004</p> <p>[11]. SRWL W3C Submission, http://www.w3.org/Submission/2004/SUBM-SWRL-20040521/</p> <p>[12]. Vocabulary Schema.org: https://schema.org/docs/gs.html</p> <p>[13]. Materials uploaded to Teams on the channel associated with the discipline</p>		
8.2 Applications (lab)	Teaching methods	No. of hours
Creation of web pages containing microdata or JSON-LD specifications	Interactive learning teaching methods	2 hours
Writing Java programs that read microdata or JSON-LD specifications		2 hours
Realization and validation of RDF documents		2 hours
Creating HTML pages that contain metadata specified with RDFa.		2 hours
Determining the field as well as the range of the ontology. Identifying similar ontologies	Dialogue	1 hour
Identifying the essential concepts of ontology	Methods that contribute to the development of critical thinking	2 hours
Building the taxonomy using the Protégé editor		4 hours
Defining relationships using the Protégé editor		1 hour
Define restrictions using the Protégé editor		2 hours
Define SWRL rules using the Protégé editor	Programs	4 hours
Ontop system. Validation of the ontology using the Ontop engine		2 hours
Ontop mappings. Querying the ontology with SPARQL	Independent and cooperative learning	4 hours



Bibliography

- [1]. S. Buraga, S. Buraga, Tehnologii XML, Polirom, Iași, 2006
- [2]. S. Buraga, Semantic Web, Matrix Rom, București, 2004
- [3]. C. Masolo, S. Borgo, A. Gangemi, N. Guarino, A. Oltramari: WonderWeb Deliverable D18. Ontology Library. IST Project 2001-33052 WonderWeb: Ontology Infrastructure for the Semantic Web, 2003
- [4]. S. J. Russel, P. Norvig, Artificial Intelligence. A Modern Approach, Prentice Hall, 1995
- [5]. G. Antoniou, F. van Harmelen, A Semantic Web Primer, second edition, MIT Press, 2008
- [6]. J. Gennari, M. Musen, R. Ferguson, W. Grosso, M. Crubzy, H. Eriksson, N. Noy, S. Tu, The evolution of Protégé-2000: An environment for knowledge-based systems development. International Journal of Human-Computer Studies, 58(1):89-123, 2003.
- [7]. N.F. Noy, D. McGuinness, A Guide to building ontologies: Ontology Development 101. A Guide to Creating Your First Ontology, March, 2001 at <http://www.ksl.stanford.edu/people/dlm/papers/ontology101/ontology101-noy-mcguinness.html>
- [8]. Popovici D. M., Zaharescu E., Rusu A., Puchianu C.M., Sburlan D., Medii virtuale multimodale distribuite, Editura Universitaria Craiova și Editura Prouniversitaria Bucuresti, 978- 606-26-0049-5, 2015, vol 3, 266 pag.
- [9]. World Wide Web Consortium. OWL Web Ontology Language Reference. W3C Recommendation, 2004
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9. Evaluation

Type of activity	9.1 Evaluation criteria	9.2 Evaluation methods	9.3 Percentage of final grade
9.4 Lecture	Active participation at the didactic activities	Discussion	10%
9.5 Lab	Completion of 1 grid test	Written/online assessment	30%
	Realization and presentation of a project	Discussion	50%
Ex officio			10%
9.6 Minimum standard of achievement / Pass requirements			
Building a taxonomy of process concepts.			

Date of
completion,
17.09.2025

Lecture instructor,
PHD. Assoc. Prof. PUCHIANU Crenguța-
Mădălina

Application instructor,
PHD. Assoc. Prof. PUCHIANU Crenguța-
Mădălina

Date of approval at Department level,
24.09.2025

Head of Department,
PHD. Assoc. Prof. PELICAN Elena

Dean,
PHD. Assoc. Prof. NICOLA Aurelian